

The Mekong Basin – Implications of Rapid Transformation of a Transboundary River System

Event synopsis

The Mekong Basin drains a vast area of eastern Asia, flowing 4,500km from the mountains of south-western China, through Laos, Thailand and Cambodia. This transboundary river basin has undergone an extremely rapid transformation, feeding and watering some 66m people. But, according to the WWF, quoted in The Economist, May 16th 2020, “All the environmental indicators are in the red.” There are 13 dams along the river: 11 in China, one in Laos and one in Cambodia. China plans eight more and Laos seven, while Cambodia has placed a moratorium on dam building.

This meeting will consider the implications of the rapid transformation for the basin, its region and other transboundary basins. The meeting comprises two virtual sessions. The first session, on Friday 5 November, will consider aspects of historical developments along the Mekong River and where these developments may be heading.

In the second session, on Friday 12 November, looks at specific developments affecting the flow regime of the Mekong river and possibilities for developing a sustainable river system.

Session 1 Title	<i>Direction of Travel of Past and Current Developments</i>
Session 1 Date	Friday 5 November 2021
Session 1 Time	09:00-12:00 GMT
Venue	Online
Event type	Virtual
Speakers	
Speaker 1	Jeremy Bird
Job title	Water Resources Advisor (former CEO of the MRC Secretariat, 2008-2011)
Bio	Jeremy specializes in water resources policy, institutions and management. He has had a diverse career working across Asia and Africa including as Director General of the International Water Management Institute (IWMI), CEO of the Mekong River Commission, senior advisor to the World Commission on Dams, and senior water resources specialist at the Asian Development Bank (ADB). As a freelance consultant, Jeremy has supported policy and strategy formulation processes at national and regional levels.
Talk Title	Challenges of rapid transformation faced by the Mekong River Commission
Abstract	The Mekong River Commission (MRC) had its roots in the UN system, with planning processes heavily influenced by multilateral and bilateral development agencies and a history of political and military conflict in the region. Over almost 40 years, up to its establishment in 1995, MRC’s emphasis was on research, basin studies and joint planning exercises for the Lower Mekong Basin. The mid-1990s also saw commissioning of the first mainstream hydropower dam on the upstream Lancang River by China. Over the next decade, the focus of the Commission was on developing the procedures needed for implementing the Mekong Agreement, particularly on notification and consultation for major projects, the exchange of data and information,

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	<p>maintaining minimum flows in the mainstream of the river, maintaining acceptable water quality and the monitoring of water use. By the mid-2000s, expectations were still that the majority of irrigation and hydropower projects in the Lower Mekong would need to be funded by overseas development assistance linked to extensive social and environmental safeguard policies. My talk will focus on two areas of rapid transformation and how the MRC reacted and adapted. The first focuses on its relationship with China as the upstream riparian as it implemented a cascade of hydropower projects on the Lancang River amid concerns voiced by local communities and the media about changing patterns of flow downstream. The second relates to a transformational shift from public to private investment in hydropower development that took place over a very short period and led, in 2010, to the first of several applications for hydropower development on the mainstream of the Lower Mekong. The talk will examine implications of these two changes for the MRC and the relationships between and within its member countries.</p>
Speaker 2	Dr Anoulak Kittikhoun
Job title	Chief Strategy and Partnership Officer, Mekong River Commission
Bio	Dr Anoulak leads the Office of CEO in charge of the MRC's work on strategic planning, international cooperation and partnership, communication and stakeholder engagement, monitoring and evaluation, and organisational development. He successfully led the formulation and adoption of the Mekong Basin Development Strategy 2016-2020 and the MRC Strategic Plan 2016-2020, as well as the new BDS 2021-2030 and MRC SP 2021-2025. He served as Team Leader of the MRC's Basin Development Plan Programme from 2012-2016.
Talk Title	The Mekong in 2030
Abstract	The Mighty Mekong, one of the great world rivers, home to over 70 million people, 6 countries, and a key to the peace and prosperity of the ASEAN Community of 660 million people, is undergoing unprecedented changes and challenges due to rapid development and climate change. What will the Mekong look like in 10 years' time if we do not get our act together, and what it will look like if we do is the subject of the talk.
Speaker 3	Professor Paul Whitehead
Job title	Professor of Water Science at University of Oxford and Managing Partner Water Resource Associates
Bio	Paul Whitehead is Professor of Water Science at the University of Oxford and Professor Emeritus from Reading University. He has over 35 years' experience of research on water quality and pollution issues, and has a special interest in modelling, including the development and application of dynamic, stochastic and planning models. He has been director of the £11 million NERC Macronutrient Cycles Programme and has been successful in running over 50 projects funded by NERC, EPSRC, ESRC, EU, EA and a range of Government Departments such as DEFRA, DFID and DTI. Professor Whitehead has served on several senior NERC committees and has also been an environmental research advisor to the EU, Belgium and Romania and he has also worked in Nepal, Thailand, India, China, Brazil, Australia and the USA. He has published widely with over 220 papers in the refereed literature

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	as well as being guest speaker at a wide range of conferences and meetings.
Talk Title	Impacts of Past and Future Dam Development and Climate Change on Flows, Sediments and Nutrients on the Mekong River from China to the Vietnam Delta System
Abstract	The livelihoods of millions of people living in one of the world's largest rivers and downstream deltas are deeply interconnected with the flow, nutrient and sediment dynamics being key considerations. In particular a sustainable supply of fluvial sediments from upstream is critical for ensuring the fertility of delta soils and for promoting sediment deposition that can offset rising sea levels. Yet, in many large river catchments this supply of sediment is being threatened by the planned construction of large dams. We have applied the Integrated Catchment (INCA) model to the Mekong River catchment in South East Asia to assess river flow, nitrogen and sediment dynamics under changing climate and extensive dam development. The results show that historical sediment flux declines are mostly caused by dams built in upper reaches and that sediment trapping will increase in the future due to the construction of new dams in PDR Lao and Cambodia. If all dams that are currently planned for the next two decades are built, they will induce a decline of suspended sediment flux of 50% with potentially damaging consequences for local livelihoods and ecosystems. Nutrient fluxes will increase, however, as agriculture intensifies, perhaps creating eutrophication conditions in the river and downstream delta. Climate change will also impact river flows, enhancing both floods and droughts.
Speaker 4	Dr Anthony Green
Job title	Director of Mekong Modelling Associates Phnom Penh Cambodia (part of JBA Group)
Bio	Anthony is a UK Civil Engineer now resident in Cambodia. He worked at HR Wallingford Overseas Unit on irrigation, then at Halcrow he completed a part time PhD in Geomorphological Modelling whilst working in Bangladesh, Pakistan, Argentina and the four Mekong countries. He returned to UK to work with JBA on the Broadlands and North Essex flood plans and River Wensum Restoration. In 2009 he moved to Laos and Cambodia to work for the Mekong River Commission as Modelling and Climate Change Advisor and has since worked as a consultant based in Cambodia for various ADB, AfDB, MRC and World Bank projects in SE Asia.
Talk Title	Another drought year or is it a flood that got lost upstream? Local perspectives and analysis of the changing Mekong hydrology
Abstract	It seems everything is changing. I will use the results of recent basin, national and local studies to illustrate the changes occurring in the Mekong catchments and floodplains, how we can understand the hydrology using models and measurements and some implications for the people, flora and fauna who live there.

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Session 2 Title	<i>Practical Realities of Developments So Far and Possible Improvements</i>
Session 2 Date	Friday 12 November 2021
Session 2 Time	09:00-12:00 GMT
Venue	Online
Event type	Virtual
Speakers	
Speaker 1	Prof. Daniel Parsons
Job title	Director of the Energy and Environment Institute & Professor in Sedimentology
Bio	Professor Parsons is an active researcher in areas related to fluvial, estuarine, coastal and deep marine sedimentary environments, exploring responses of these systems to climate and environmental change, for example understanding how evolving flood risk on large mega-deltas can impact populations and related regional and global food security - through to understanding the impact of plastics, particularly in coastal and marine environments. As the Director of the Energy and Environment Institute, he has gathered together a multidisciplinary team of over 170 researchers, with a portfolio of active research grants and projects of over £29M. It also hosts three flagship taught MSc programmes as well as being home to the EPSRC-NERC Aura Centre for Doctoral Training in Offshore Wind and Environment.
Talk Title	Anthropogenic impacts on tidal intrusion and flood hazard in the Mekong delta
Abstract	Many of the world's major river deltas face a sustainability crisis, as they come under threat of increases in salinity and the extent of tidal zones forced by combinations of sea-level rise, changes in river discharge and channel geometry. The relative contribution of these factors to future increases in tidal extent remains unconstrained, with most prior work emphasising the role of climate-driven sea-level rise. Here we use new field data from the Mekong delta to measure variations of river discharge and changes of channel geometry, and project them into the future. We combine these with projections of future sea-level rise into a 2D hydrodynamic numerical model and quantify the influence of the different driving factors on future tidal extension into the delta. We show that within the next two decades, tidal extension into the Mekong delta will increase by up to 56 km due to channel deepening (92%), dominantly driven by anthropogenic sediment starvation. Furthermore, even under strong mitigation scenarios, sediment starvation still drives a long-term commitment to future tidal extension. Specifically, by 2098 eustatically rising sea-levels are predicted to contribute only modestly to the projected extension. These findings demonstrate the urgent need for policy makers to adopt evidence-based measures to reverse negative sediment budgets that drive tidal extension into sediment starved deltas.
Speaker 2	Dr Stephen Darby
Job title	Professor of Geography, University of Southampton

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Bio	Steve Darby obtained his PhD in fluvial geomorphology from the University of Nottingham in 1994. After postdoctoral positions at the University of Florence in Italy and the US Department of Agriculture National Sedimentation Laboratory in Oxford, Mississippi, Steve took up a lectureship in geography at the University of Southampton in 1997, being promoted to Professor in 2011. Steve researches the morphodynamic processes that affect large rivers and their deltas, and has undertaken a series of NERC funded studies on the Mekong system.
Talk Title	Impacts of sand mining on bank erosion in the Mekong delta
Abstract	<p>The Mekong delta is strategically important both within and beyond Vietnam, as its fertile soils support a highly productive agricultural sector that sustains livelihoods and food security for around 18 million inhabitants. Similar to many other large deltas, the Mekong is increasingly coming under anthropogenic stress as a result of climate change, upstream damming, groundwater extraction that leads to accelerated subsidence, and intensive sand mining. Indeed, changes in channel morphology induced by large-scale sand mining are already known to be significantly affecting tidal hydrodynamics and saltwater intrusion (Eslami et al., 2019; Vasilopoulos et al., 2021). However, more recently there have been concerns that intensive sand-mining is also leading to an increasing severity and frequency of major episodes of river bank erosion. Such episodes can lead to a loss of agricultural land and river-side infrastructure, including residential dwellings, and they therefore also pose a serious risk to human life. Here I will report the findings of recent work in which my colleagues and I have explored the extent to which sand mining versus other potential drivers of change is (or is not) leading to changes in river bank erosion. To do this we employed a numerical simulation approach in which we used a 2D finite-element seepage analysis to predict how seepage in- and outflows to and from the river banks, and consequently river bank pore-water pressures, respond to combinations of semidiurnal tidal fluctuations acting in concert with seasonal variations in monsoonal flood pulse. The outputs of these seepage simulations are then combined with a limit equilibrium stability analysis to determine the associated variations in factor of safety (an index of propensity for bank collapse: FoS values less than 1 indicate a bank prone to collapse). We have conducted these simulations for a range of study site locations that together encompass a full range of delta morphological contexts (as represented by variable cross-section morphology), while moving from the coarser-grained and fluvially dominated reaches near the apex of the delta through to the finer-grained, tidally dominated, areas closer to the sea. In each case simulations were undertaken for an annual cycle using water level records observed at nearby gauging stations and for years representing high, average, and low flow conditions. We used the results to develop risk diagrams that highlight the relative risk of mass failure being triggered under the varying bank morphology, sedimentological and hydrological/tidal forcings. Our results show that severe bed erosion, caused by intense sand mining, is the dominant factor driving increased risk of bank failure, suggesting that management of sand mining is urgently needed to control dangerous bank erosion within the Mekong delta.</p>

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Speaker 3	Dr Cedric Laize and Professor Julian R. Thompson
Job title	CL: Hydro-ecological Modeller, Senior Scientist, UKCEH JRT: Professor of Physical Geography – Hydrology and Wetlands, UCL
Bio	<p>Dr Laize is an ecohydrologist at UKCEH. Before moving to the UK, he worked as a lecturer in hydrology and hydraulics at the Institute of Technology of Cambodia (ITC), Phnom Penh from 1999 to 2001. His research includes a particular focus on approaches for environmental flow assessment. This includes pan-European impact assessments, methodology development to inform UK-wide environmental management and studies in Africa and Asia, including the Mekong.</p> <p>Professor Thompson is a hydrologist with particular research interests in wetlands, numerical modelling and climate change. He has over 30 years of research and consultancy experience that includes work in the UK, Europe, Africa and Asia. The latter includes catchment-scale modelling of the Mekong Basin and detailed assessments of wetland ecohydrological functioning within the Mekong Delta to support conservation-oriented management.</p>
Talk Title	TEFRIC-ERFA: Development of environmental flow approaches and their application to the Mekong River Basin
Abstract	<p>The hydrological characteristics of a river are key determinants of ecological processes and exert critical controls upon aquatic ecosystems. Changes in these characteristics due to factors that include climate change or water resources management may therefore impact riverine ecosystems and the people who depend upon them. The science of environmental flows has developed with the need to assess such impacts and a range of approaches are now available. Assessment methods that are useful both to researchers and practitioners requires data and tools that are both robust and easy to use by non-specialists. This talk will cover methodological developments and earlier results for the Mekong from collaborative research undertaken by UKCEH and UCL. This ultimately led to the UK Natural Environmental Research Council (NERC) funded project “Translation of Environmental Flow Research in Cambodia” (TEFRIC) which, in collaboration with the Institute of Technology of Cambodia and the Tonle Sap Authority, developed TEFRIC-ERFA. This user-friendly code, developed using R and shiny, is based on the Ecological Risk due to Flow Alteration (ERFA) screening method which was originally designed for application in Europe. Tailoring the code to SE Asia, development of a user-interface and demonstration of the final software included a series of workshops in Cambodia involving participants representing governmental organisations, academia, NGOs and consultancies from lower Mekong riparian states. In the talk we will demonstrate TEFRIC ERFA, which is now freely available for download, and its application to river flow projections for the Mekong.</p>
Speaker 4	Professor Philip Hirsch
Job title	Emeritus Professor of Human Geography, School of Geosciences, University of Sydney, Australia
Bio	Philip Hirsch is a geographer with four decades’ experience of teaching and researching in and on mainland Southeast Asia. During

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	<p>his 30 years at the University of Sydney, he served as Director of the Australian Mekong Resource Centre (AMRC) from 1997-2017. Professor Hirsch has published extensively on environment, development and natural resource governance in the Mekong Region. His work extends from detailed community level studies to the geopolitics of river basin governance, including an investigation published as <i>National Interests and Transboundary Water Governance in the Mekong</i> (DANIDA and AMRC, 2006). His more recent book-length publications include the co-authored <i>The Mekong: A Socio-legal Approach to River Basin Development</i> (Earthscan, 2016) and the edited <i>Handbook of the Environment in Southeast Asia</i> (Routledge, 2017). Professor Hirsch speaks and reads Thai and Lao fluently, has intermediate Vietnamese and elementary Khmer.</p>
Talk Title	<p>From lightly impounded to engineered river: implications for the politics of governing the Mekong</p>
Abstract	<p>The rapid shift of the Mekong from a rather lightly impounded basin to one that is increasingly heavily engineered has diverse implications for the role of transboundary institutions, strategies of civil society, regulation by governments and coordinated management of mainly corporate-owned hydropower projects. These changes require a rethinking of governance in a rapidly engineered river system. The scope for physical flow regulation facilitated by Mekong Basin hydropower operations has proceeded much more quickly than legal and institutional regulation through advances in transboundary governance. This talk will focus mainly on civil society challenges in adapting to this rapid transformation. River basin closure implies a shift of civil society concern beyond the questioning of future dams toward the challenges of dealing with existing ones, a shift that presents a number of dilemmas to NGOs, media, university researchers and other civil society actors. The talk commences with a quick overview of the basin transformation and history of civil society concerns. Questions of flow regulation that maintain basic ecological functions of the basin go well beyond seasonality of water flows and extend into sediment flux and fisheries in particular. Associated with this is a need to understand the redistribution of “goods” derived from the river system in both geographic terms and between public and private actors. The talk concludes with a number of suggested questions that civil society needs to pose to state and corporate actors regarding the governance of the now physically regulated basin for the public good.</p>

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Programme and running order *Please attached the programme and running order if applicable*

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09:00	Start
09:00-09:05	Welcome and Introduction Dr Ian Tod (IWF Chair)
09:05-09:35	Challenges of rapid transformation faced by the Mekong River Commission Jeremy Bird, Water Resources Advisor (former CEO of the MRC Secretariat, 2008-2011)
09:35-09:40	Q & A
09:40-10:10	The Mekong in 2030 Dr Anoulak Kittikhoun, Chief Strategy and Partnership Officer, Mekong River Commission
10:10-10:15	Q & A
10:15-10:45	Impacts of Past and Future Dam Development and Climate Change on Flows, Sediments and Nutrients on the Mekong River from China to the Vietnam Delta System Professor Paul Whitehead, Professor of Water Science at University of Oxford and Managing Partner Water Resource Associates
10:45-10:50	Q & A
10:50-11:20	Another drought year or is it a flood that got lost upstream? Local perspectives and analysis of the changing Mekong hydrology Dr Anthony Green, Director of Mekong Modelling Associates Phnom Penh Cambodia (part of JBA Group)
11.20-11.25	Q & A
11.25-11.50	General discussion
11.50-12.00	Closing remarks.

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09:35-09:40	Q & A
09:40-10:10	Impacts of sand mining on bank erosion in the Mekong delta Dr Stephen Darby, Professor of Geography, University of Southampton
10:10-10:15	Q & A

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10:15-10:45	TEFRIC-ERFA: Development of environmental flow approaches and their application to the Mekong River Basin Dr Cedric Laize, Hydro-ecological Modeller, Senior Scientist, UKCEH Professor Julian R. Thompson, Professor of Physical Geography – Hydrology and Wetlands, UCL
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